HYDRONGEN RELIEF VALVE SIZING FOR THE MUCOOL VACUUM VESSEL

Relief Valve for the Vacuum vessel (25 liters of H2 to vaporize from the vacuum vessel)

Calculation of the relief flow capacity

CGA S-1.3-1995 sizing of the primary relief valve as per paragraph 5.2.2

Vessel MAWP (psig)	17.630 (P)	
Flow rating pressure (psia)	25.000 P	*CGA p10*
vi, specific volume of liquid relieved (ft^3/lb)	0.243 V	*6.8 l=0.24 ft^3*
C: cst of gas of vapor related to ratio of specific heat	357.000 C	
Z: compressibility factor a the temperature T and flow rating pressure P	1.000 Z	
M: molar weight of fluid	2.020 M	
Temperature at maximum flow rate (R)	44.820	
Relief valve flow capacity in SCFM of air - loss of insulation vacuum	**2.06E-04**	
F (correction factor for heat transfer)	1.000 F	
Gu, gaz factor for ininsulated container	45.800 Gu	
Mean of absorber surface area (in+out) (square feet)	1.978 A	
Relief valve flow capacity in SCFM of air - fire case	**80.13**	
V (SCFM)	80.126	
Massflow H2 (g/s) *calculated w/ the vessel wetted area, 25 liters of H2, and 20W/m^2 of flux	200.000	$W = 7.9\ 3*m$
W, flow capacity (lbs/hr)	**1587.4**	

Calculation of the relief valve area

W (lbs/hr.)	1587.400	
M (hydrogen)	2.020	
Temperature at maximum flow rate (R)	44.820	
Z (-)	1	
C (hydrogen)	357.000	
Kd, coeff. of discharge	0.9575	$A = \dfrac{W\sqrt{TZ}}{C\,K_b K_d P_1 \sqrt{M}}$
Kb, capacity corrector factor	1	
P1, upstream relief pressure (psia)	25.0	
Area, of the relief valve (in^2)	**0.875**	
Equivalent diameter (in)	**1.056**	